

**METAMORPHISM OF CORDIERITE GNEISSES FROM EASTERN GHAT GRANULITE TERRAIN, ANDHRA PRADESH, SOUTH INDIA ; D.S.N. Murthy and S. Nirmal Charan National Geophysical Research Institute Hyderabad 500 007 India.**

Cordierite-bearing metapelites of the Eastern Ghat granulite terrain occur in close association of Khondalites (Garnet-sillimanite gneisses), quartzites, calc-silicate rocks and charnockites. The present study is limited to the rocks occurring between Bobbili in the north and Guntur in the south of Andhra Pradesh.

Cordierite-garnet-biotite-sillimanite-quartz-ilmenite  $\pm$  spinel  $\pm$  plagioclase  $\pm$  hypersthene  $\pm$  K-feldspar  $\pm$  corundum  $\pm$  anthophyllite form the mineral assemblage of these rocks. The association of the mineral and their textural relationship suggest the following metamorphic reactions: (i) Garnet + sillimanite + quartz = cordierite, (ii) hypersthene + sillimanite + quartz = cordierite, (iii) hypersthene + sillimanite + quartz = cordierite, (iii) sillimanite + spinel = cordierite + corundum, and (iv) biotite + quartz + sillimanite = cordierite + K-feldspar. Generally the minerals are not chemically zoned except garnet-biotite showing zoning when they come in close contact with one another.

The potential thermometers are provided by the Fe-Mg distribution of coexisting biotite-garnet and cordierite-garnet. Temperature of  $750^{\circ} \pm 50^{\circ}$  is estimated based on garnet-biotite geothermometry<sup>1,2,3</sup>. The temperature estimated from the cordierite-garnet thermometry<sup>1,4</sup> is  $730^{\circ} \pm 60^{\circ}$  C.

Conflicting interpretation of the P/T dependence of these reactions involving cordierite are due to  $H_2O$  in the cordierite. The estimates of  $H_2O$  in cordierite are made<sup>5</sup> and pressure estimated at  $P_{H_2O} = 0$  is  $5.3 \pm 0.2$  Kb, while  $P_{H_2O} = P_{Total}$  the maximum pressure

obtained for the cordierite gneisses is  $7.0 \pm 0.3$  Kb. The positive optic axis measured in cordierite of these rocks is indicative of participation of  $P_{CO_2}$  in the metamorphic equation<sup>6</sup> suggesting the  $P_{H_2O} < P_{Total}$ . The presence of alkali feldspar-quartz assemblage which is common in these gneisses will be constrained from melting only if  $H_2O$  activity is less than 0.5. The piezometric array inferred is convex towards the temperature array, indicating a rapid and isothermal crustal uplift probably aided by thrust tectonics.

#### REFERENCES

1. Thompson, A.B., 1976, Amer.J.Sci., 276, 425-454.
2. Lee, S.M. and Holdaway, M.J., 1978, Edited by J.G. Keacock, Amer. Geophysical Union Monograph 20, 79-94.
3. Perchuk, L.L., Podlesskii, K.K., Aranovich, L.Ya, 1981, In: Newton, R.C., Navrotsky, A., Wood, B.J., (Eds) Thermodynamics of minerals and melts. Springer Berlin, Heidelberg, New York, 111-129.
4. Currie, K.L., 1974, Contrib Mineral Petrol., 44, 35-44.
5. Bhattacharya, A. and Sen, S.K., 1985, Contrib.Mineral. Petrol., 89, 371-378.
6. Armbruster, T.H. and Bloss, F.D., 1980, Nature, 186, 140-141.